5 inter-dependent mathematical proficiencies

Conceptual understanding:
Mathematical concepts and ideas should be built on, deepened and connected as learners experience increasingly complex mathematical ideas. Learners demonstrate conceptual understanding through being able to explain and express concepts, find examples (or non-examples) and by being able to represent a concept in different ways, flowing between different representations including verbal, concrete, visual, digital and abstract.

Logical reasoning:
As learners experience increasingly complex concepts, they also should develop an understanding of the relationships between and within these concepts. They should apply logical reasoning about these relationships and be able to justify and prove them. Justifications and proof should become increasingly abstract, moving from verbal explanations, visual or concrete representations to abstract representations involving symbols and conventions.

Communication with symbols:
Learners should understand that the symbols they are using are abstract representations and should develop greater flexibility with the application and manipulation of an increasing range of symbols, understanding the conventions of the symbols they are using.

Strategic competence (formulating problems mathematically in order to solve them): Learners should become increasingly independent in recognising and applying the underlying mathematical structures and ideas within a problem, in order to be able to solve them.

Fluency:
As learners experience, understand and apply increasingly complex concepts and relationships, fluency in remembering facts, relationships and techniques should grow, meaning that facts, relationships and techniques learned previously should become firmly established, memorable and usable.

5 inter-dependent mathematical proficiencies

Give learners opportunities to demonstrate **conceptual understanding** by...
...explaining & expressing concepts
...finding examples and non-examples
...representing a concept in different ways, flowing between verbal, concrete, visual, digital and abstract.

Give learners opportunities to **communicate with symbols** by...
...showing understanding of the conventions of symbols used
...applying and manipulating a range of symbols
....knowing what symbols are abstract representations of – link to concrete/visual

Give learners opportunities to demonstrate **strategic competence** by...
...Formulating problems mathematically in order to solve them
...Recognising the mathematics needed to solve a problem
...Applying the mathematics need to solve a problem

Give learners opportunities to demonstrate **fluency** by...
...rapid recall of facts, relationships and techniques
...consolidating previous learning so it is memorable and useable

Give learners opportunities to demonstrate **logical reasoning** by...
...understanding relationships between and within concepts
...applying logical reasoning about the relationships
..justifying and proving relationships
...moving from verbal explanations, visual, concrete to abstract using symbols and conventions

How the Mathematics and Numeracy AoLE promotes the four purposes

Promoting ambitious, capable learners ready to learn throughout their lives by...

Securing skills in mathematical lessons and applying them in cross-curricular activities and experiences.

Explaining concepts and ideas, checking solutions when problem solving.

Demonstrating a depth of knowledge appropriate to age and ability.

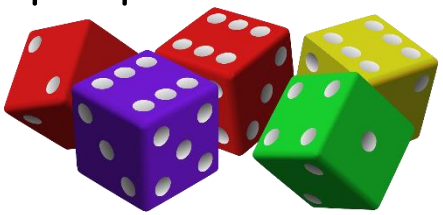
Developing a keen ongoing interest in mathematics that is purposeful to future needs.

Communicating ideas and methods orally and in writing

Finding and understanding numerical information in a purposeful way in order to be independent, life-long learners

Encouraging curiosity, acceptance of mistakes and learning from them in a purposeful way

How the Mathematics and Numeracy AoLE promotes the four purposes



Promoting enterprising, creative contributors ready to play a full part in life and work by...

Encouraging learners to take risks when considering different ways of tackling mathematical and numerical problems.

Promoting mathematical problem-solving and reasoning skills to confidently tackle a variety of problems including real-life contexts.

Developing resilience applying mathematical skills to creative challenges, individually and in groups.

Instilling competency to analyse mathematical situations and construct logical arguments in response

Promoting creativity when looking at different ways of tackling problems.

How the Mathematics and Numeracy AoLE promotes the four purposes

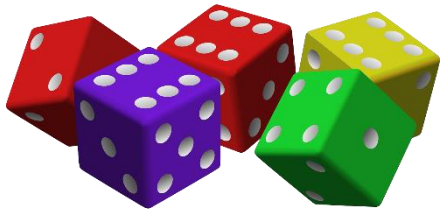
Promoting ethical, informed citizens of Wales and the world by...

Creating opportunities to have evidence based discussions.

Enabling the critical analysis of data to develop informed views on social, political, economic and environmental matters.

Promoting pupils' understanding of personal, local, national and international finance.

How the Mathematics and Numeracy AoLE promotes the four purposes



Promoting healthy, confident individuals ready to lead fulfilling lives as valued members of society by...

Developing confidence and resilience to face and overcome challenges and solve problems.

Encouraging using numeracy skills across the curriculum to make informed, effective choices and decisions to ensure lifelong health and well-being.

Instilling knowledge and skills to manage personal finance and budgeting now and in the future, intercepting information and data to assess risk.

Enabling understanding and taking of different roles within a group to form positive relationships based upon trust and mutual respect.

What is changing?

In the early years, play forms an important part in the development of mathematics and numeracy, enabling learners to solve problems, explore ideas, establish connections and collaborate with others.

In later years learners need to have opportunities to work both independently and collaboratively to build on the foundations established in the early years.

For all ages, real-life examples drawn from the local, national and international environment help learners make connections between the concrete and the abstract. Real-life contexts can be used to introduce and explore mathematical concepts, as well as to consolidate them. Indeed, teaching which introduces a reasoning and problem-solving approach to all mathematics and numeracy experiences supports the development both of positive dispositions and of the four purposes of the curriculum, as well as supporting the development of the mathematical proficiencies.

A change in emphasis from 'What' to 'What and How' will influence pedagogy and result in teaching for conceptual understanding

The Mathematics and numeracy AoLE should provide rich contexts for developing the four curriculum purposes

Ambitious, capable learners ready to learn throughout their lives

Ethical, informed citizens of Wales and the world

Enterprising, creative contributors ready to play a full part in life and work

Healthy, confident individuals ready to lead fulfilling lives as valued members of society

Numeracy involves applying and connecting these 5 proficiencies in a range of real-life contexts.

conceptual understanding

communication with symbols

fluency

strategic competence

logical reasoning

Use verbs such as 'explore' and 'derive' to ensure balance between 'breadth' and 'depth'.

Gives learners opportunities to use manipulatives and represent concepts in a variety of ways.

What Matters

1. **Exploring the number system to represent and compare relationships between numbers and quantities.**
2. **Using symbol systems to express relationships between numbers, quantities and relations.**
3. **Relationships involving properties of shape, space, and position, and that measurement focuses on quantifying phenomena in the physical world.**
4. **The relationships between representing data and identifying probability, and that both support informed inferences and decisions.**

Connections and relationships are key – made explicit through real-life concepts